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Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,461,269**, on March 16, 2004, by **PLASTIQUES GYF LTÉE**, assignee of Germain Véronneau, for "Bladeless Mixer".

Agent certificateur/Certifying Officer

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ABSTRACT

A bladeless mixer for agitating and mixing compounds comprising a supporting surface rotatably mounted onto a support structure about a first vertical axis of rotation and a rim mounted onto the supporting structure. The rim is coaxial to the support surface and has an internal surface extending above the supporting surface. The mixer also comprises at least one wheel rotatably mounted onto the supporting surface about a second axis of rotation parallel to the first axis of rotation. The at least one wheel has an external surface meshing with the internal surface of the rim so as to cause the wheel to spin on itself about the second axis of rotation upon rotation of the supporting surface. The at least one wheel spins in a direction opposed to a rotation of the supporting surface and has an upwardly opening cavity wherein a container containing the compounds to be agitated and mixed is inserted in a tight-fit manner. The mixer also comprises driving means for driving the supporting surface in rotation about the first axis of rotation.

BLADELESS MIXER

FIELD OF THE INVENTION

The present invention relates to a mixer, and more particularly to a mixer with no blade which can fully and uniformly mix compounds.

BACKGROUND

Agitating and mixing compounds in a container is generally done with mixers having impellers producing a flow pattern within the container to achieve the desired results. These impellers are usually of the type straight-blade turbine radial flow, pitched-blade turbine mixed flow or hydrofoil impeller axial flow, depending of the flow pattern required. Dirty accumulations surrounding the work area are produced during the mixing process. Therefore, cleaning these mixers require large quantity of solvents.

Moreover, although these known mixers are appropriate for mixing a large range of compounds, they are not suitable for some others because the impellers create a lot of friction on the compounds, which can result in substance damage and change.

In addition, good mixing often requires that the impellers will mix the content of the entire container, which can be difficult to do. Mixing of compounds with these mixers can thus result in an uneven mixing of the compounds.

Known in the art are Japanese Patents Nos. 2003/093862 (HIROSHIGE), 2001/276592 (HIROSHIGE) and 2000/271465 (HIROSHIGE), which disclose apparatuses that fully agitate and mix compounds to be kneaded. The apparatuses disclosed in these patents use rotation and revolution to agitate and mix the compounds. These apparatus, also referred to as bladeless mixers, mix

the compounds by simultaneously rotating a batch container and revolving it in a planetary motion, thus producing acceleration forces of 400 G and higher. The mixing principle underneath these apparatus is generated by both centrifugal and centripetal forces. The advantage of such mixers is that they mixed liquids and powders evenly in seconds while imparting no heat. Since the container is rotated at a predetermined angle, air is entrapped within the container. Therefore, once the mixing is complete, an additional step is required to remove submicron bubbles present within the compounds. Another problem with these apparatuses is that they are very costly and complicated to build.

SUMMARY OF THE INVENTION

The first object of the present invention is to provide a bladeless mixer capable of overcoming the above-mentioned drawbacks.

More specifically, a first object of the present invention is to provide a bladeless mixer which is cheap to mass produce.

Another object of the present invention is to provide a bladeless mixer which considerably reduces the use of solvent.

Still another object of the present invention is to provide a bladeless mixer which requires no cleaning.

A further object of the present invention is to provide a bladeless mixer which is easy to operate and wherein the mixing of the product is done in a short period of time.

Still another object of the present invention is to provide a bladeless mixer which produces no substance damage and changes.

Another object of the present invention is to provide a bladeless mixer which avoids air entrapment within the compounds in the container.

According to the present invention, the above objects are achieved with a bladeless mixer for agitating and mixing compounds. The mixer comprises a supporting surface rotatably mounted onto a support structure about a first vertical axis of rotation and a rim mounted onto the supporting structure. The rim is coaxial to the support surface and has an internal surface extending above the supporting surface. The mixer also comprises at least one wheel rotatably mounted onto the supporting surface about a second axis of rotation parallel to the first axis of rotation. The at least one wheel has an external surface meshing with the internal surface of the rim so as to cause the wheel to spin on itself about the second axis of rotation upon rotation of the supporting surface. The at least one wheel spins in a direction opposed to a rotation of the supporting surface and has an upwardly opening cavity wherein a container containing the compounds to be agitated and mixed is inserted in a tight-fit manner. The mixer further comprises driving means for driving the supporting surface in rotation about the first axis of rotation.

The objects, advantages and other features of the present invention will become more apparent upon reading of the following non-restrictive description of preferred embodiments thereof, given with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a bladeless mixer according to a first embodiment of the present invention.

Figure 2 is a schematic perspective view of the bladeless mixer shown in Figure 1.

Figure 3 is a side view of the bladeless mixer shown in Figure 2.

Figure 4 is a perspective view of a bladeless mixer according to a second embodiment of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to Figures 1 to 3, there is shown a bladeless mixer 2 according to a first preferred embodiment of the invention, which is devised to agitate and mix compounds in a container 4.

The mixer 2 has a supporting surface 10 rotatably mounted onto a supporting structure 3 about a first axis 5 of rotation and a rim also mounted onto the supporting structure 3. The supporting surface 10 is rotated by a driving shaft 12. Any other suitable driving mechanism could be used to rotate the supporting surface 10. A motor (not shown) drives the driving shaft 12 in rotation. The rim is coaxial to the supporting surface 10 and has an internal surface 1 extending above the supporting surface 10. In the illustrated embodiment, the rim is an internal gear 6 having teeth 14 located on its internal surface 1.

The mixer 2 also has at least one wheel, preferably a pinion 8, rotatably mounted onto a supporting surface 10 about a second axis 9 of rotation parallel to the first axis 5 of rotation. The pinion 8 has an external surface 13 meshing with the internal surface 1 of the internal gear 6 so that, upon rotation of the driving shaft 12, the supporting surface 10 rotates in a direction depicted by arrow 7, and the pinion 8 spins on itself about the second axis of rotation 9, but in an direction opposed to a rotation of the supporting surface 10, as depicted by arrow 11, due to meshing of teeth 14. The pinion 8 is preferably mounted onto the supporting surface 10 near the outer perimeter of the same to be submitted to a greater centrifugal force.

An upwardly opening cavity 18 is formed within the pinion 8 to allow the container 4 containing the compounds to be agitated and mixed to be inserted in a tight-fit manner. To avoid great vibrations within the mixer 2 during the mixing of the compounds, the cavity 18 has a diameter slightly larger than the diameter of the container 4. It is also possible to use an adaptor to fit a smaller container 4 in a larger cavity 18.

The container 4 can have a plurality of form, for example, square, circular, oval and any other suitable shape. Of course, the cavity 18 must be designed to receive such containers 4 having different shapes.

As shown in Figure 3, the pinion 8 is rotatably mounted onto the supporting surface 10 with bearings 22 enabling the pinion 8 to spin on itself during rotation of the supporting surface 10.

The container is rotated in an upright position, thus avoiding air entrapment within the container 4. Consequently, there is no need for an additional step to deaerate down submicron bubbles present within the compounds.

The rotation speed of the drive shaft 12 can be controlled by any suitable control means (not shown) to submit the container to predetermined G forces. In another preferred embodiment of the invention, the driving shaft 12 could be replaced by any other driving device for driving the supporting surface 10 in rotation at a desired speed.

There is no need to use solvent for cleaning the mixer 2 because there is no impeller in contact with the compounds. Consequently, since there is no mechanical part directly in contact with the compounds, there is no substance damage or changes.

Figure 4 shows a second preferred embodiment of the present invention, wherein the mixer 2 comprises a plurality of pinions 8 inserted in other containers 4 (not shown) to allow simultaneous agitation and mixing of other compounds. The fact that there are several pinions 8 is interesting in that such balances the supporting surface 10. In the first preferred embodiment discussed hereinabove, it could also be possible to add some weight to balance the supporting surface 10 if only one pinion 8 is used.

In all possible embodiments of the present invention, the internal gear 6 and pinion 8 can be made of plastic, metal or any other material conventionally material used for internal gear and pinion structures. Moreover, the speed at which the compounds in the container 4 will be agitated and mixed can be modified by changing the size of the wheel(s). Thus, a wheel having a smaller diameter will spin on itself at a higher speed of rotation than a wheel having a bigger diameter.

Furthermore, it is also possible to use a rim and a wheel having complementary internal surface 1 and external surface 13 so as to provide friction between both the wheel and the rim; thus causing the wheel to spin on itself upon rotation of the supporting surface 10.

Although the present invention has been explained hereinabove by way of preferred embodiments thereof, it should be pointed out that any modifications to these preferred embodiments within the scope of the appended claim are not deemed to alter or change the nature and scope of the present invention.

CLAIMS

1. A bladeless mixer for agitating and mixing compounds, said mixer comprising :

a supporting surface rotatably mounted onto a support structure about a first vertical axis of rotation;

a rim mounted onto the supporting structure, said rim being coaxial to the support surface and having an internal surface extending above said supporting surface;

at least one wheel rotatably mounted onto the supporting surface about a second axis of rotation parallel to the first axis of rotation, said at least one wheel having an external surface meshing with the internal surface of the rim so as to cause the wheel to spin on itself about the second axis of rotation upon rotation of said supporting surface, said at least one wheel spinning in a direction opposed to a rotation of the supporting surface and having an upwardly opening cavity wherein a container containing the compounds to be agitated and mixed is inserted in a tight-fitting manner; and

driving means for driving the supporting surface in rotation about the first axis of rotation.

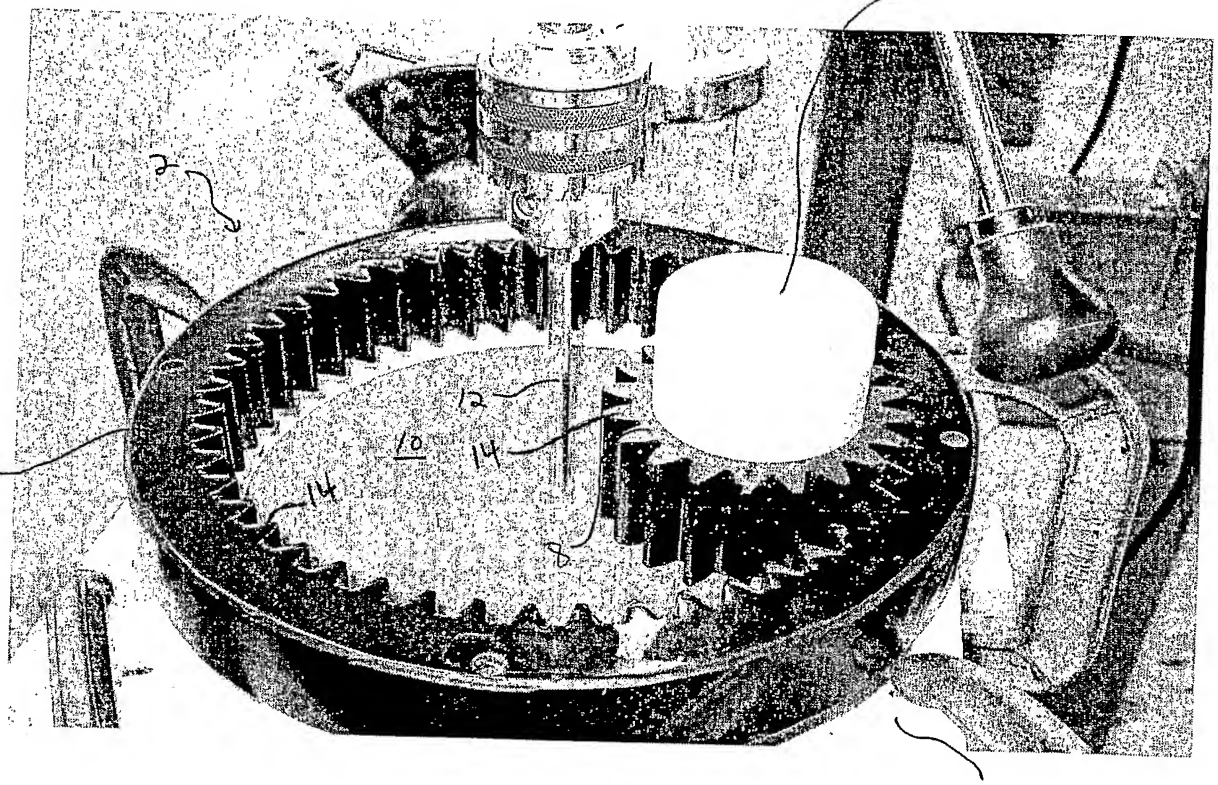

FIG. 1

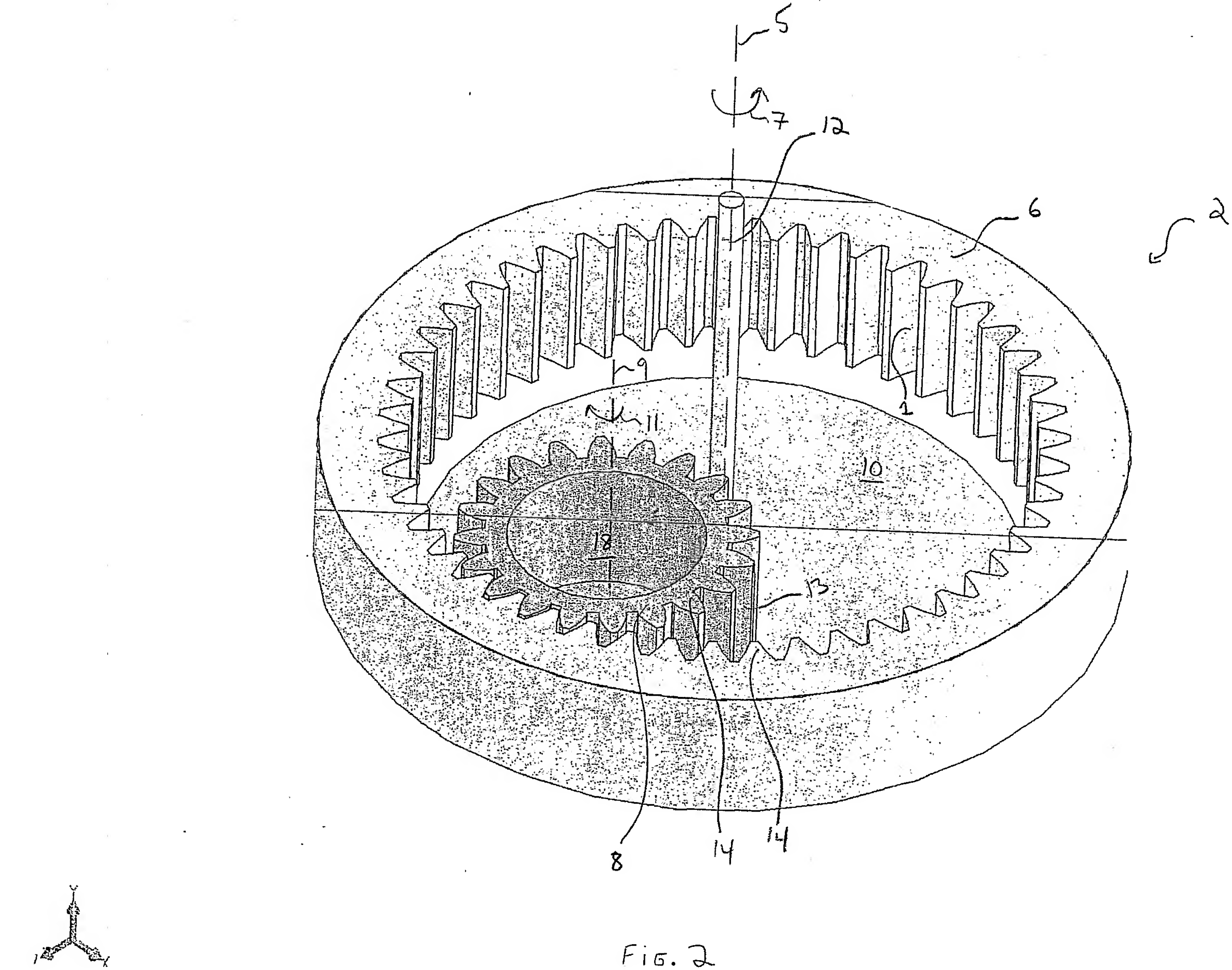

FIG. 2

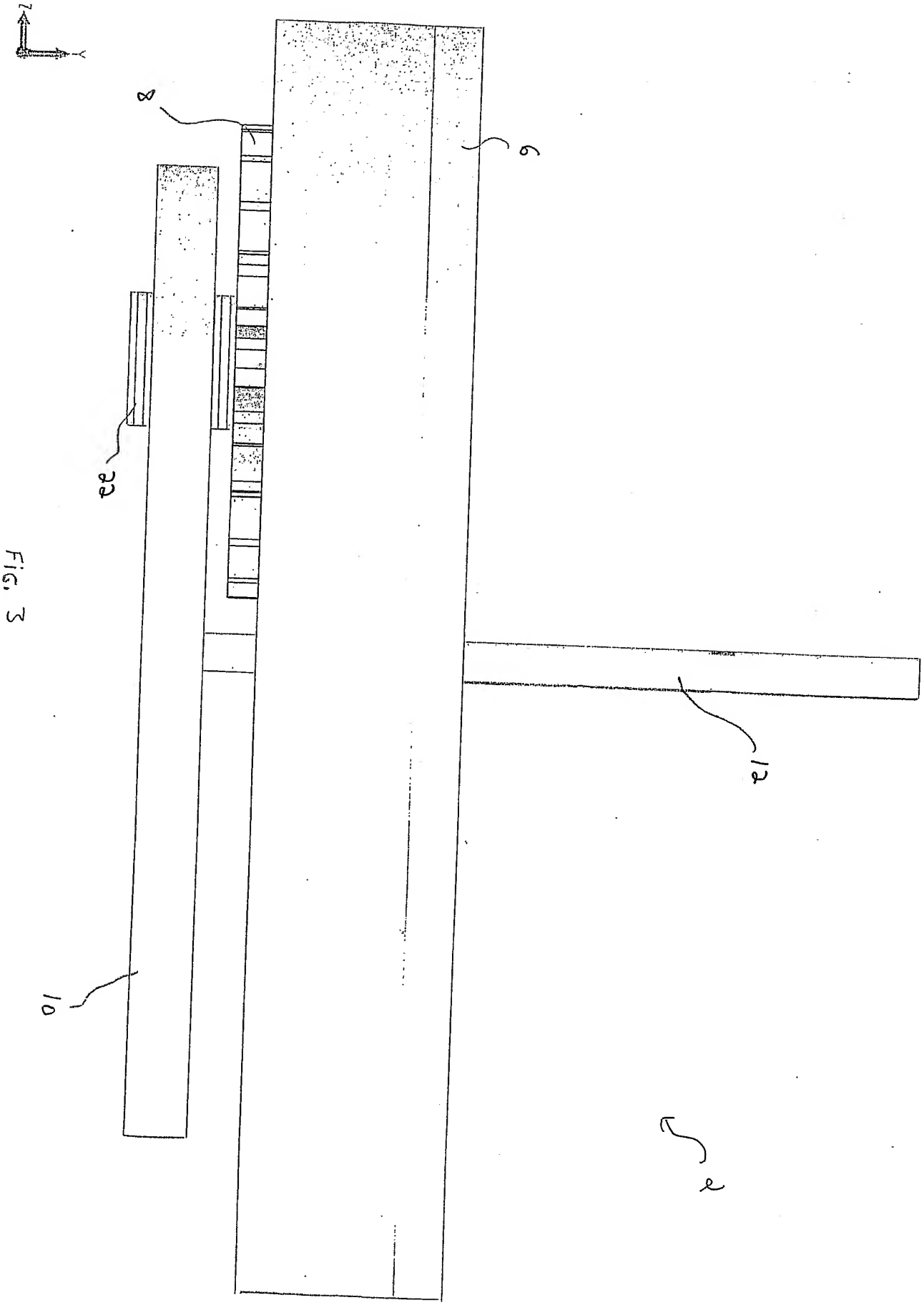

Fig. 3

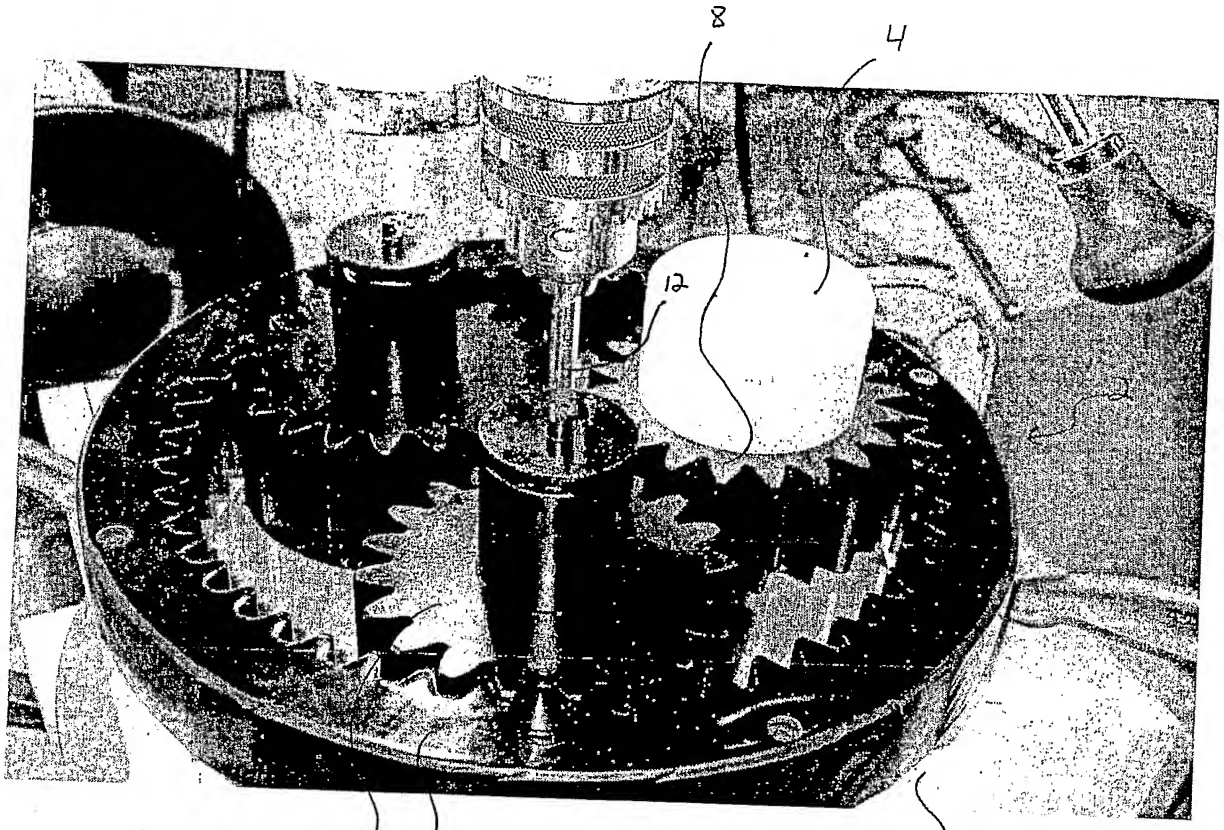

Fig. 4